RELATION BETWEEN CAROTID ISCHEMIC EVENTS AND LEGNTH OF INTERNAL CAROTID STENOSIS

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Introduction

High-grade internal carotid stenosis (ICS) >70% is a leading cause of ischemic stroke. ¹ However, a considerable percentage of stroke survivors with a symptomatic ICS have <70% stenosis. ^{2,3} Different characteristics such as fibrous plaques or thin ruptured cap or ultrasonographically echolucent plaque have been identified as markers for high risk plaques. ⁴ Whether the length of the ICS is also associated with a high risk of ischemic stroke has never been investigated.

Methods

In a carotid disease register based approach, 208 ICS in 168 patients with stroke or transient ischemic attack were identified. The degree of ICS was measured by ultrasound, the length by ultrasound, MR-angiography and/or DSA. Plaque echogenicity was classified into predominantly hypoechogenic, mixed or predominately echogenic category.

Results:

A statistically significant inverse relationship between the length and degree of ICS was detected for the internal carotid artery of the symptomatic ($p = -0.33$, $p < 0.001$) but not of the asymptomatic side ($p = 0.06$, $p = 0.65$). The median (IQR) length for <70% symptomatic ICS was 18 (14.88-21.00) mm, whereas for ≥70% symptomatic ICS was 16 (12-20) mm ($p = 0.047$). A cut-off length for ICS of ≥14.46 mm was found to have a sensitivity and specificity of 78% and 48%, respectively for differentiating between symptomatic and asymptomatic stenosis. ICS of the symptomatic side were significantly more echolucent

compared to the ICS of the asymptomatic side (44% vs 27%, $p = 0.02$). This relation was even more evident among <70% ICS (symptomatic versus asymptomatic; echolucent plaques 46.7% versus 24.5%, echogenic 35.6% versus 67.9%; $p = 0.006$).

Conclusion:

Stroke occurrence in patients with ICA-stenosis <70% might be – to some extent - related to plaque length and plaque echolucency. Patients with **ICS <70% of ≥14.88 mm length, especially if the plaque is echolucent** should be considered as high risk patients and might profit from frequent follow-up examinations or even carotid revascularization procedures.

Table 1: Different plaque characteristics among symptomatic and asymptomatic internal carotid stenosis. IQR, interquartile range.

	Symptomatic side (n=133)	Asymptomatic side (n=67)*	p-value
Plaque echolucency, n (%)			
Hypoechoic	55 (44%)	17 (27%)	0.02+
mixed	17 (13.6%)	5 (7.9%)	0.34+
Echogenic	53 (42.4%)	41 (65.1%)	0.03+
Severity of stenosis, n (%)			
< 70%, n (%)	46 (35.1%)	56 (88.9%)	<0.001
≥ 70%, n (%)	85 (64.9%)	7 (11.1%)	
Plaque length in duplex in mm, median (IQR)			
All carotid arteries	17.0 (12.0-20.51)	16.0 (12.0-	0.40
<70% ICA stenosis	18.0 (14.88-21.0)	19.25)	0.08
≥70% ICA-stenosis	16.0 (12-20)	15.5 (12.0-19.0)	0.64
		18.0 (11-20)	

*In 8 patients the stenosis could not be classified, + statistical analysis for a difference between the mentioned type versus both other types

Figure 1: Assessment of length of internal carotid artery stenosis. Representative example of a duplex scan (B-mode). The length of stenosis was measured from the most proximal to the most distal stenotic area (indicated by a dashed line)

Figure 2: Relation between the length of internal carotid artery stenosis among symptomatic and asymptomatic arteries in patients with <70% versus ≥ 70% ICS.

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